In the Claims

1. (currently amended) A method for detecting symbols of a modulated signal received via channels of a wireless communications system, comprising:

obtaining an initial estimate of a symbol transmitted via the channels from a previous channel estimate and a received symbol;

updating the channel estimate;

optimizing a next estimate of the transmitted symbol which maximizes an expectation of a log likelihood function by averaging a logarithm of a likelihood function over unknown parameters $\underline{h}$ of the channels;

quantizing the next estimate of the transmitted symbol;

comparing the quantized next estimate of the transmitted symbol with the initial estimate of the transmitted symbol to determine if the initial estimate of the transmitted symbol and the quantized next estimate of the transmitted symbol have converged; and otherwise

inputting the quantized next estimate of the transmitted symbol as the initial estimate of the transmitted symbol; and

repeating the updating, the optimizing, the quantizing, and the comparing until the initial estimate of the transmitted symbol and the quantized next estimate of the transmitted symbol converge; and further comprising:

determining a posterior covariance matrix $\underline{\hat{\Sigma}_p}$ of the channels using a FFT matrix **W**, the initial estimate of the transmitted symbol $\mathbf{X}_p$, the received symbol **Y**, and a Gaussian noise variance σ^2 as

$\hat{\Sigma}_p = (\mathbf{W}^H \mathbf{X}_p^H \mathbf{X}_p \mathbf{W}/\sigma^2)^{-1}$;

determining a posterior mean $\hat{h}_p$ of a channel impulse response as

$\hat{h}_p = \hat{\Sigma}_p (\mathbf{W}^H \mathbf{X}_p^H \mathbf{Y}/\sigma^2)$;

determining a channel update coefficients matrix **C** for recovering the next estimate of the transmitted symbol; and

applying the coefficient matrix **C** to the posterior mean $\hat{h}_p$, the FFT matrix **W**, and the received symbol **Y** according to $\tilde{X}_{p+1} = \mathbf{C}^{-1}(\hat{h}_p^H \mathbf{W}^H \mathbf{Y})^T$ to optimize the next estimate of the transmitted symbol $\tilde{X}_{p+1}$.

2. (previously presented) The method of claim 1 wherein the modulated signal is a MPSK modulated signal having a positive constant equivalent to an energy of the modulated signal, and using only phase information during the updating.

3. (previously presented) The method of claim 1 wherein the comparing further comprises:

subtracting the initial estimate of the transmitted symbol from the quantized next estimate of the transmitted symbol to obtain a difference; and

determining that the initial estimate and the quantized next estimate have converged when an absolute value of the difference is less than a predetermined threshold.

4. (previously presented) The method of claim 1 further comprising:

obtaining the initial estimate of the transmitted symbol from the channel estimate of a pilot symbol received via the channels.

5. (previously presented) The method of claim 1 further comprising:

obtaining the initial estimate of the transmitted symbol from the channel estimate of a previously received symbol.

6. (previously presented) The method of claim 1 wherein the optimizing further comprises:

using only a fast Fourier transform matrix, the received symbol, and the previous channel estimate .

7. (previously presented) The method of claim 1 wherein the next estimate of the transmitted symbol is quantized according to a constellation of the received signal.

8. (canceled)

9. (previously presented) The method of claim 1 further comprising:

determining a posterior covariance matrix $\hat{\Sigma}_p$ of the channels using a FFT matrix $\mathbf{W}$, the previous estimate of the transmitted symbol $\mathbf{X}_p$, a channel convergence matrix Σ^{-1}, and a Gaussian noise variance σ^2 as $\hat{\Sigma}_p = (\mathbf{W}^H \mathbf{X}_p^H \mathbf{X}_p \mathbf{W}/\sigma^2 + \Sigma^{-1})^{-1}$;

determining a posterior mean $\hat{\underline{h}}_p$ of a channel impulse response as

$\hat{\underline{h}}_p = \hat{\Sigma}_p(\mathbf{W}^H\mathbf{X}_p^H\mathbf{Y}/\sigma^2 + \Sigma^{-1} E\{\underline{h}\})$, where the received symbol is **Y**, and $E\{\underline{h}\}$ is a channel impulse response;

determining a channel update coefficients matrix **C** for recovering the next estimate of the transmitted symbol; and

applying the coefficient matrix **C** to the posterior mean $\hat{\underline{h}}_p$, the FFT matrix **W,** and the received symbol **Y** according to $\tilde{\underline{X}}_{p+1} = \mathbf{C}^{-1}(\hat{\underline{h}}_p^H \mathbf{W}^H \mathbf{Y})^T$ to optimize the next estimate of the transmitted symbol $\tilde{\underline{X}}_{p+1}$.

10. (canceled)

11. (currently amended) The method of claim 1,~~further comprising:~~ ~~modulating the signal~~ wherein the modulated signal received was modulated using orthogonal frequency division multiplexing.

12. (currently amended) A system for detecting symbols of a modulated signal received via a plurality of channel of a wireless communications system, comprising:

means for obtaining an initial estimate of a symbol transmitted via the channels;

means for updating the channel estimate;

means for optimizing a next estimate of the transmitted symbol which maximizes an expectation of a log likelihood function by averaging a logarithm of a likelihood function over unknown parameters $\underline{h}$ of the channels;

means for quantizing the next estimate of the transmitted symbol;

means for comparing the quantized next estimate of the transmitted symbol with the previous estimate of the transmitted symbol to determine if the initial estimate and the quantized next estimate have converged; and otherwise

means for making the quantized next estimate of the transmitted symbol an input for a next iteration; and

means for repeating the updating, the optimizing, the quantizing, and comparing until the initial estimate of the transmitted symbol and the quantized next estimate of the transmitted symbol converge; and further comprising:

means for determining a posterior covariance matrix $\hat{\Sigma}_p$ of the channels using a FFT matrix **W**, the initial estimate of the transmitted symbol $\mathbf{X}_p$, the received symbol **Y**, and a Gaussian noise variance σ^2 as

$\hat{\Sigma}_p = (\mathbf{W}^H \mathbf{X}_p^H \mathbf{X}_p \mathbf{W}/\sigma^2)^{-1}$;

means for determining a posterior mean $\hat{h}_p$ of the channel impulse response as $\hat{h}_p = \hat{\Sigma}_p(\mathbf{W}^H \mathbf{X}_p^H \mathbf{Y}/\sigma^2)$;

means for determining a channel update coefficients matrix **C** for recovering the next estimate of the transmitted symbol; and

means for applying the coefficient matrix **C** to the posterior mean $\hat{h}_p$, the FFT matrix **W**, and the received symbol **Y** according to

$\tilde{X}_{p+1} = \mathbf{C}^{-1}(\hat{h}_p^H \mathbf{W}^H \mathbf{Y})^T$ to maximize the next estimate of the symbol $\tilde{X}_{p+1}$.

13. (previously presented) The system of claim 12 wherein the modulated signal is a multiple phase shift keying modulated signal having a positive constant equivalent to an energy of the modulated signal, and using only phase information during the updating.

14. (previously presented) The system of claim 12 further comprising:

means for subtracting the initial estimate of the transmitted symbol from the quantized next estimate of the transmitted symbol to obtain a difference; and

means for determining that the initial estimate and the next estimate have converged when an absolute value of the difference is less than a predetermined threshold.

15. (previously presented) The system of claim 12 wherein the initial estimate of the transmitted symbol is obtained from a pilot symbol received via the channels.

16. (previously presented) The system of claim 12 wherein the initial estimate of the transmitted symbol is obtained from a channel estimate from a previously received symbol.

17. (canceled)

18. (previously presented) The system of claim 12 further comprising:

means for determining a posterior covariance matrix $\hat{\Sigma}_p$ of the channels using the FFT matrix **W**, the initial estimate of the transmitted symbol $\mathbf{X}_p$, a channel convergence matrix Σ^{-1}, and a Gaussian noise variance σ^2 as $\hat{\mathbf{\Sigma}}_p = (\mathbf{W}^H \mathbf{X}_p^H \mathbf{X}_p \mathbf{W}/\sigma^2 + \mathbf{\Sigma}^{-1})^{-1}$;

means for determining a posterior mean $\hat{\underline{h}}_p$ of a channel impulse response as $\hat{\underline{h}}_p = \hat{\mathbf{\Sigma}}_p(\mathbf{W}^H \mathbf{X}_p^H \mathbf{Y}/\sigma^2 + \mathbf{\Sigma}^{-1} E\{\underline{h}\})$, where the received symbol is **Y** and $E\{\underline{h}\}$ is a channel impulse response;

means for determining a channel update coefficients matrix **C** for recovering the estimate of the next transmitted symbol; and

means for applying the coefficient matrix **C** to the posterior mean $\hat{\underline{h}}_p$, the FFT matrix **W**, and the received symbol **Y** according to $\tilde{\underline{X}}_{p+1} = \mathbf{C}^{-1}(\hat{\underline{h}}_p^H \mathbf{W}^H \mathbf{Y})^T$ to maximize the next estimate of the symbol $\tilde{\underline{X}}_{p+1}$.

19. (canceled)

20. (currently amended) The system of claim 12 wherein the <u>modulated</u> signal <u>received was</u> ~~is~~ modulated using orthogonal frequency division multiplexing.